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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

46. Proposed by T. W. PALMER, Professor of Mathematics, University of Alabama.

A borrows \$500 from a building and loan association and agrees to pay \$9.50 per month for 72 months, the first payment to be made at the end of the first month. What rate of interest does he pay? The association claims to charge only 8% (the legal rate in Alabama). How can the per cent. be figured out?

Solution of unsolved problem in Vol. II, p. 74, by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.

Let r = rate per month, $12r$ = rate per annum, p = sum borrowed, n = number of payments, q = cash payment. Then, from Algebra, we get

$$q = \frac{pr(1+r)^n}{(1+r)^n - 1}, \quad q = 9\frac{1}{2}, \quad p = \$500, \quad n = 72.$$

$$\therefore (q - pr)(1+r)^n = q, \text{ and } (19 - 1000r)(1+r)^{72} = 19.$$

$$\therefore r = .00911, \text{ and } 12r = .10932 = 10.932\% \text{ per annum.}$$

ALGEBRA.

293. Proposed by C. E. WHITE, Vanderbilt University, Nashville, Tenn.

Prove by mathematical induction that $\frac{(x-a)^{m-1}}{(m-1)!} f^{m-1}(a) + \frac{(x-a)^{m-2}}{(m-2)!} f^{m-2}(a) + \dots + \frac{(x-a)^2}{2!} f''(a) + (x-a)f'(a) + f(a)$ will be the remainder when $f(x)$ is divided by $(x-a)^m$.

Solution by the PROPOSER.

If $\phi(x)$ be the quotient found by dividing $f(x)$ by $(x-a)$ we can write the identity

$$\frac{f(x)}{x-a} = \phi(x) + \frac{f(a)}{x-a}.$$

Differentiating both members and solving for $f(x)/(x-a)^2$,

$$\frac{f(x)}{(x-a)^2} = \frac{f'(x)}{x-a} + \frac{f(a)}{(x-a)^2} - \phi'(x). \quad (1)$$